

Gender Differences in the Impact of Social Support on Work-Family Positive Spillover for Japanese Engineers

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Abstract

This study aims to examine the relationship between social support and work-family positive spillover for Japanese engineers working in private sectors. Positive spillover refers to transfer of favorable experiences such as mood or behaviors from one role domain to another, such as work/family to family/work (Carlson et al., 2006). Specifically, we address the following research questions: (1) Do men and women in engineering exhibit different levels of work-family positive spillover? (2) Are there gender differences in the impact of social support on work-family positive spillover? Our results showed that women engineers experienced significantly higher levels of work-family positive spillover, compared to their male counterparts. We also found that social support was significantly and positively associated with work-family positive spillover, controlling for other factors. Results from this study suggest that having nonresidential relatives and friends whom engineers can count on receiving assistance with family care, is likely to have positive impact on their work as engineers.

Keyword

Gender, social support, work, family, engineer

Introduction

The proportions of women in Science, Technology, Engineering, and Mathematics (STEM) fields are small in many countries, and enhancing diversity is important for creating innovation and development. In STEM fields, women in engineering are particularly small population. The notion of “leaky pipeline” describes that women tend to leave STEM fields as their career progress, resulting in even smaller proportions of women in higher positions (Blickenstaff, 2005). There are several factors associated with women’s leaks in pipeline, such as gender bias towards women and lack of role models for junior women in STEM fields, and the difficulty of balancing work and

family responsibilities is considered one of the significant factors (Blickenstaff, 2005). Thus, increasing the number of women may be necessary for solving the problem of women's shortage in STEM fields in the long run, but simply increasing the number of women is not sufficient to facilitate career persistence as well as career development for women (and men) already in those fields.

Undertaking work and nonwork roles does not necessarily result in role conflict. Rather, these roles may interact each other to increase the overall quality of life. For example, the concept of work-family positive spillover suggests that favorable experiences transferred from one role domain to another (Carlson, Kacmar, Wayne, & Grzywacz, 2006). Then, what factors may increase the likelihood of positive spillover between work and family domains? Oludayo & Omonijo (2020) states that “synergizing the domains of work and life necessitates support from all strata of management, family, and other informal social networks.” Stress models suggest that social support plays a significant role in reducing the negative impact of stressors (Carlson & Perrewé, 1999). Past research consistently found that support from supervisors and co-workers has a significant positive influence on employees' performance in the workplace (Carlson & Perrewé, 1999). As to social support in nonwork domains, while some research examined how support from a spouse improves work-life balance (e.g., Oludayo & Omonijo, 2020), still little is known about the impact of other types of social support in nonwork domains on work-family relationships. Furthermore, we do not know whether and how the impact of social support in nonwork domains on work-family positive spillover differs for men and women.

Thus, this study investigates associations between social support and work-family positive spillover for Japanese engineers, since proportions of women in engineering are particularly small in STEM fields. For example, it may be possible that social support from nonresidential relatives and friends improves engineers' overall well-being, particularly for those with children, and promote positive spillover between family and work domains. In addition, this study examines gender differences in the influence of social support in nonwork domains on work-family positive spillover. This is because, as pointed out earlier, difficulty in work-life balance is one of the major reasons behind women's “leaks” in career pipeline in STEM fields.

Contextual Background

According to a survey conducted in 2020 by the Ministry of Internal Affairs and Communications, the proportion of women researchers in Japan has reached the record high of 16.9% (Statistics Bureau, Ministry of Internal Affairs and Communications, 2020). However, this proportion is significantly smaller compared with many other industrialized nations, such as about 33% in the

United States (note that this statistic includes employed scientists but excludes engineers), around 39% in the United Kingdom, and about 20% in the Republic of Korea (Cabinet Office, 2019). As in the United States, women's proportion remains small in Japan in STEM occupations, but the proportion is even smaller compared to the United States. Another characteristic worth noting about Japan is the gender difference in the types of organizations researchers belong. Approximately 60% of women researchers in Japan belong to universities and university-related research institutions, while around 36% of them belong to private sectors (Statistics Bureau, Ministry of Internal Affairs and Communications, 2019). We see an opposite pattern of concentration among men. About 65% of men researchers work in private sectors, and around 31% of them belong to universities and university-related research institutions (Statistics Bureau, Ministry of Internal Affairs and Communications, 2019). For researchers in university settings, women occupy 11.9% in engineering and technology fields (e.g., mechanical engineering, shipbuilding and aeronautical engineering, electrical engineering and telecommunications engineering, civil engineering, or architecture) and 17.1% in physical science fields (e.g. mathematics, physics, information science, chemistry, or biology) (Statistics Bureau, Ministry of Internal Affairs and Communications, 2020). For researchers employed in private sectors, women specialized in engineering and technology shared only 6.3%, and 14.7% in physical sciences (Statistics Bureau, Ministry of Internal Affairs and Communications, 2020).

As in other industrialized nations, engineering jobs in private sectors have traditionally been male-dominated in Japan. It is important to increase the proportion of women in engineering for creating innovation. We believe it is important to understanding what women and men in engineering experience in the process of their career development. As stated above, the difficulty of balancing work and family responsibilities is one of the significant factors related to the "leaky pipeline" in STEM fields (Blickenstaff, 2005). Past research found that women Japanese Research and Development (R&D) engineers' perceptions of work-life *imbalance*, such as not being able to balance work and family responsibilities, were negatively associated with their intentions to continue to work at current workplaces, as well as their life-time career persistence as engineers (Fujimoto & Shinohara, 2012; Shinohara & Fujimoto, 2016). This finding, as well as the correlates of "leaky pipeline" indicated in earlier studies, suggests that it is important to consider engineers' experiences in both work and family domains for their career development.

Our study aims to examine the relationship between social support and work-family positive spillover for Japanese engineers working in private sectors. As an indicator of engineers' social support, this study focuses on their relationships with relatives who are not living together and friends. Drawing on the stress models, we expect that having supportive relationships with

relatives and friends in terms of housework and childcare is likely to enhance positive spillover. Moreover, this study investigates gender differences in the impact of social network on work-family positive spillover. Specifically, we address the following research questions: (1) Do men and women in engineering exhibit different levels of work-family positive spillover? (2) Are there gender differences in the impact of social support on work-family positive spillover?

Conceptual Framework

Positive Work-Family Interfaces

Consistent with the role accumulation theory (Sieber, 1974) which suggests that having multiple social roles does not always cause conflicts between those roles but could be beneficial for individuals, scholars have developed concepts indicating positive relationships between work and family domains. There are several concepts that capture positive associations between work and family, such as work-family facilitation (Wayne, Musisca, & Fleeson, 2004), enhancement (Ruderman, Ohlott, Panzer, & King, 2002), enrichment (Greenhaus & Powell, 2006), and positive spillover (Carlson et al., 2006).

First, work-family facilitation is experienced when performing one role, and gaining resources by performing the role, make it easier to participate in the other role (Wayne et al., 2004). For example, facilitation of work and family life suggests that skills, behaviors, or positive mood gained by involving in work (family) would have positive impact on family (work) domain (Wayne et al., 2004). Enhancement indicates that social and psychological resources are strengthened by participating in multiple roles (Ruderman et al., 2002). Work-family enrichment results when experiences in one role improve the quality of life or individual performance in the other role (Greenhaus & Powell, 2006), suggesting that an individual's experience in work domain would improve the quality of life in his/her family domains, and vice versa. Finally, work-family positive spillover refers to favorable experiences, such as mood, skills, values, and behaviors are transferred from one role (work/family) to the other role (family/work) (Carlson et al., 2006), and that would improve individuals' well-being. Work-family enrichment builds on the basic concept of positive spillover, but these two concepts are distinct. On one hand, work-family enrichment emphasizes that experiences in one domain would improve individual performance in the other role (Carlson et al., 2006). On the other hand, positive spillover suggests that experiences in one role domain can be transferred to the other role, but they would not improve the quality of life or individual performance in the other role (Carlson et al., 2006).

Given those concepts, we focus on work-family positive spillover in order to understand whether and how multiple roles affects engineers' psychological well-being or levels of overall quality of

life, rather than finding out specific aspects of improvement in performance in work and family domains. Work-family positive spillover is bi-directional, indicating both “work-to-family” positive spillover and “family-to-work” positive spillover.

Past research has shown that personality, job characteristics, and environmental factors are associated with positive relationships between work and family domains (Poelmans, Stepanova, & Masuda, 2008). For instance, women, older individuals, and those who are extroverted are likely to experience positive work-family interface (Poelmans et al., 2008). Job autonomy, skill variety, and complexity are also found to promote positive spillover between work and family domains (Poelmans et al., 2008). Environmental factors include support from supervisors and colleagues (Poelmans et al., 2008), as well as support from family (Lapierre, Li, Kwan, Greenhaus, DiRenzo, & Shao, 2017). Thus, we expect that women engineers are experiencing higher levels of positive spillover between work and family domains, compared to men.

Social Support in Nonwork Domain and Work-Family Interfaces

According to stress models, social support reduces the negative effects of stressors (Carlson & Perrewe, 1999), while enhancing individual well-being. Carlson & Perrewe (1999) found that men and women who have strong social support both in work and nonwork domains are less likely to experience strain in those domains. Furthermore, social support in each domain promotes satisfaction with life in the domain. Therefore, those who receive social support in work or nonwork domains are more likely to be satisfied with work and family life (Carlson & Perrewe, 1999). These findings suggest that social support in work and family domains increase the levels of individuals' satisfaction with those domains and their overall well-being, resulting in a higher likelihood of positive spillover between work and family domains. Previous studies indicate that support from supervisor and spouse promotes work-life balance (Oludayo & Omonijo, 2020). Also, as stated above, social support from family is likely to enhance a positive relationship between work and family (Lapierre et al., 2017). In addition to support from co-residing family members, we expect that support from nonresidential relatives and friends could also be important resource to improve an individual's well-being by reducing stressors related to housework and childcare. Then, it will facilitate work-family positive spillover.

Past research indicates that women are generally more likely than men to give and receive support in interpersonal relations (Oludayo & Omonijo, 2020). Because women still tend to have higher levels of family responsibilities, social support is one of the important resources for them to manage their work and family roles (Malik, Saif, Gomez, Khan, & Hussain, 2010). Furthermore, women tend to receive more social support in nonwork domain than in the workplace (Marcinkus,

Whelan-Berry, Gordon, 2007). Therefore, we expect that women engineers receive higher levels of social support than men. In addition, it is possible that the impact of social support on positive spillover between work and family differs for men and women engineers.

Methodology

Data

Data used in this study come from an online survey conducted in 2018 by the first author. Analytic sample for this study was 167 men and 127 women engineers working in private sectors in Japan. We restricted our sample to those who have less than 25 years of work experience as an engineer. This is because a portion of men in our sample had work tenure much longer than women, and by limiting years of experience to less than 25 years for both genders, we believe that the experiences of men and women engineers become more comparable in our analysis. We also restricted our sample to those who have children so that we could explore engineers' family experiences in contexts where interactions with child(ren) take place.

Measurement

Dependent Variables: Work-Family Positive Spillover

As mentioned above, work-family positive spillover is bi-directional in nature, such that “work-to-family” positive spillover and “family-to-work” positive spillover. We referenced existing scales (e.g., Hanson, Hammer, & Colton, 2006) to tap positive spillover. Work-to-family positive spillover was measured by a scale which was the unweighted average of the following two items: “Because things are going well at work, I am in a positive mood at home.” and “Experiences gained at work help me in my family life. (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree)” The internal reliability (Cronbach's Alpha) of the scale was .778. Similarly, family-to-work positive spillover was measured by a scale which was the unweighted average of the following two items: “Because things are going well at home, I am able to work efficiently.” and “Because things are going well at home, I am in a positive mood at work. (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree)” The internal reliability (Cronbach's Alpha) of the scale was .910.

Focal Independent Variable (1): Social Support

The focal independent variable in this study was social support. Social support was measured by a scale which was the unweighted average of the following four items: “I have relatives (excluding those who are living in the same household) whom I can ask for help in housework and childcare.” “I have friends whom I can ask for help in housework and childcare.” “I have relatives whom I can talk about my family issues.” and “I have friends whom I can talk about my family issues.”

Responses ranged from 5=strongly agree to 1=strongly disagree. The internal reliability (Cronbach's Alpha) of the scale was .815.

Focal Independent Variable (2): Gender

The other focal independent variable was gender, coded as 1=men or 0=women.

Control Variables

We also controlled for following factors. First, respondents' specialization areas in their highest degree were coded as 1=STEM or 0=non-STEM fields. Years of experience as engineer was computed by deducting respondents' age at receiving their highest degrees from respondents' age at the time of the survey. Support from supervisors and co-workers was measured by a scale constructed with the following two items: "My supervisor is supportive for my family life." and "My co-workers are supportive for my family life." Responses ranged from 5=strongly agree to 1=strongly disagree. The internal reliability of the scale was .883. Workplace climate was measured by a scale created by the following two items: "Workers are able to talk about family life in our workplace." and "At my work, it is welcome to leave early, come in late, or take a day off because of family reasons." Responses ranged from 5=strongly agree to 1=strongly disagree. The internal reliability of the scale was .781. Communications in the workplace was measured by an item "Employees communicate to each other well in my workplace." Job autonomy was measured by an item "I have autonomy in my work." Responses ranged from 5=strongly agree to 1=strongly disagree. Age of the youngest child was measured in years. For those who have an only child, the age of the child was used. Time spent on housework and childcare (including interactions with children) in a week-day was measured by a scale which was the unweighted average of the following two items. "How much time do you spend on housework in a given week-day?" and "How much time do you spend on childcare or interactions with your child(ren)?" Responses ranged from 6=more than 2 hours, 5=1.5 hours to 2 hours, 4=1 hour to 1.5 hours, 3=30minutes to 1 hour, 2=less than 30 minutes, 1=none.

Analytic Strategies

First, we examined gender differences in mean scores for all the variables used in this study. Then, we estimated a series of Ordinary Least Squares (OLS) regression models. In the analyses, social support was entered into the initial model. Then, gender was added to Model 2. In Model 3, all other variables were added to Model 2. In Model 4, we tested an interaction effect between gender and social support to investigate whether the impacts of social support on work-family positive spillover differs for men and women.

Results

Descriptive Results

Table 1 shows descriptive statistics and results from a series of t-tests examining gender differences in mean scores of variables used in analyses. First, the mean of “family-to-work” positive spillover was significantly higher for women (3.35) than for men (3.04). Similarly, the mean score of “work-to-family” positive spillover was significantly higher for women (3.15) than for men (2.98). Therefore, women engineers experience significantly higher levels of both “family-to-work” and “work-to-family” positive spillover, compared to their male counterparts. Next, women exhibited mean score in social support (3.34) significantly higher than men (2.85).

Mean scores for all other variables showed gender differences. For instance, men (0.77 or 77%) were more likely than women (0.49 or 49%) to have their highest degrees in STEM fields. Men had significantly longer experience as engineers (18 years) than women (15 years). Women reported significantly higher levels of social support from supervisors and co-workers (3.75) than men (3.19). Likewise, women exhibited significantly higher mean scores than men in workplace climate (3.65 for women and 3.23 for men) and communication among co-workers (3.67 for women and 3.26 for men). Levels of job autonomy was significantly higher for women (3.40) than men (3.19). Age of the youngest child was significantly smaller for women (4.5 years old) than men (7.8 years old). Finally, women were much more likely to spend time on housework and childcare in a given week-day (4.70), compared to men (2.84).

Table 1 Descriptive Statistics and Results of T-tests for Gender Differences in Mean Scores

Variables	Men (n=167)				Women (n=127)		Mean Difference
	Min	Max	Mean	S.D.	Mean	S.D.	
Family-to-work positive spillover	1	5	3.04	0.81	3.35	0.90	**
Work-to-family positive spillover	1	5	2.98	0.81	3.15	0.87	†
Social support	1	5	2.85	0.79	3.34	0.93	***
Specialization areas (1=STEM)	0	1	0.77	0.42	0.49	0.50	***
Years of experience as engineer	0	25	18.19	6.44	14.92	6.04	***
Supervisor and co-worker support	1	5	3.19	0.90	3.75	0.96	***
Workplace climate	1	5	3.23	0.92	3.65	0.94	***
Communications in the workplace	1	5	3.26	1.03	3.67	0.91	***
Job autonomy	0	1	3.19	1.03	3.40	0.99	†
Age of the youngest child	0	23	7.75	5.06	4.52	4.60	***
Time spent on housework and childcare	1	6	2.84	1.09	4.70	1.22	***

Note 1: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$

Multivariate Results

Table 2 and Table 3 show results from OLS regressions predicting Japanese engineers’ work-family positive spillover. First, we discuss results of OLS regressions predicting “family-to-work”

positive spillover (Table 2). Model 1 indicates that social support was positively associated with family-to-work positive spillover. Model 2 shows that social support continued to enhance positive spillover, controlling for gender. This model also shows that being a man was negatively associated with positive spillover. In Model 3, in which all other variables were entered to the model, social support continued exert significantly positive impact on spillover, controlling for other factors. This model indicates that having supportive relationships with relatives and friends on housework and childcare tends to promote positive spillover from family to work for engineers. Among the variables additionally entered the equation, years of experience as engineers was negatively associated with positive spillover, whereas age of the youngest child and time spent on housework and childcare were found to promote positive spillover from family to work domains. Finally, in Model 4, we tested an interaction effect of social support and gender (1=men). The positive effect of interaction term reached statistical significance, indicating that the impact of having social support was *stronger* for men than for women.

Next, Table 3 shows results of OLS regressions predicting “work-to-family” positive spillover. Model 1 shows that social support was positively associated with work-to-family positive spillover while in Model 2 the positive effect of social support was still significant, after controlling for gender. Model 3 shows that the effect of social support remained statistically significant, holding other factors constant. Thus, having supportive social network on housework and childcare has significant positive impacts on promoting both “family-to-work” and “work-to-family” positive spillover for engineers with children. Model 3 also indicates that men were more likely than women to experience positive spillover from work to family. Years of experience as engineers were negatively associated with spillover. Workplace climate, job autonomy, age of the youngest child, and time spent on housework and childcare were found to increase work-to-family positive spillover. In Model 4, we added an interaction term of social support and gender, however, it did not turn out statistically significant. This means that the impact of social support on work-to-family positive spillover did not differ for men and women engineers.

Table 2: Regression Models Predicting Family-to-Work Positive Spillover

Variables	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Social support	.320 ***	.054	.294 ***	.056	.182 ***	.056	.242 ***	.060
Gender (1=men)			-.173 †	.099	.122	.124	.052	.125
Specialization areas (1=STEM)					-.060	.098	-.072	.097
Years of experience as engineer					-.017 *	.008	-.016 *	.008
Supervisor and co-worker support					.095	.081	.078	.081
Workplace climate					.097	.087	.084	.086
Communications in the workplace					.102	.068	.109	.067
Job autonomy					.077	.051	.079	.051
Age of the youngest child					.021 *	.010	.024 *	.010
Time spent on housework and childcare					.101 *	.042	.111 **	.041
Social support*Gender							.288 **	.105
Adjusted R ²	.104		.110		.239		.257	

Note 1: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$

Table 3: Regression Models Predicting Work-to-Family Positive Spillover

Variables	Model 1		Model 2		Model 3		Model 4	
	B	SE	B	SE	B	SE	B	SE
Social support	.344 ***	.052	.343 ***	.054	.269 ***	.055	.303 ***	.059
Gender (1=men)			-.012	.096	.242 *	.122	.202	.124
Specialization areas (1=STEM)					-.099	.096	-.106	.096
Years of experience as engineer					-.017 *	.008	-.016 *	.008
Supervisor and co-worker support					-.055	.080	-.065	.080
Workplace climate					.203 *	.086	.196 *	.085
Communications in the workplace					.044	.067	.048	.067
Job autonomy					.095 †	.050	.096 †	.050
Age of the youngest child					.024 *	.010	.025 **	.010
Time spent on housework and childcare					.104 **	.041	.110 **	.041
Social support*Gender							.163	.105
Adjusted R ²	.127		.124		.231		.235	

Note 1: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$

Conclusion

Proportions of women are still small in STEM occupations. Women's higher likelihood of leaving STEM occupations along the line of their career progression, and smaller proportions of women in higher positions/ranks suggests the presence of "leaky pipeline" (Blickenstaff, 2005). Among the factors associated with this phenomenon, such as gender bias towards women and lack of role models for younger women in STEM fields, the difficulty in balancing work and family roles is particularly important. Engineering and technology are two dominant areas of specialization among researchers in Japan. In those areas, there are about 388,000 researchers working in private sectors. However, women consist of only 6.3% (Statistics Bureau, Ministry of Internal Affairs and Communications, 2020).

This study focused on work-family positive spillover for Japanese engineers in private sectors and

examined gender differences in the impact of social support on work-family positive spillover. Stress models indicate that individuals who receive social support at work and home are less likely to be strained and more likely to be satisfied with the life in those domains (Carlson & Perrewe, 1999). It is possible that receiving social support in work and nonwork domains enhances individuals' physical and psychological well-being and likely to facilitate positive spillover between work and family domains. Past research suggests that supervisory and spousal support are related to better work-life balance (e.g., Oludayo & Omonijo, 2020). Focusing on social support in nonwork domain, we predicted that social support from relatives or friends for housework and childcare was an important resource for Japanese engineers to enhance work-family positive spillover.

First, we found that men engineers experienced significantly lower levels of “family-to-work” and “work-to-family” positive spillover, compared to women engineers. This means that women engineers with children were more likely than their male counterparts to experience positive interactions between work and family domains. Time spent on housework and childcare was significantly shorter for men than women. Likewise, levels of social support were lower for men engineers than women. Women were more likely than men to have relatives or friends whom they can talk about or ask for assistance in housework and childcare. Across models in multivariate analyses, we found that social support was significantly and positively associated with both “family-to-work” and “work-to-family” positive spillover, controlling for other factors. Interestingly, the impact of having supportive relationships with relatives and friends as to housework and childcare on “family-to-work” positive spillover was indeed *stronger* for men than women. Our results suggest that it is beneficial for men in engineering industry, where has traditionally been male-dominated and work-centered, to engage in housework and childcare and have social support. Having relatives, who are not living in the same household, and friends whom engineers can count on receiving assistance with family care is likely to have positive impact on their work as engineers. Findings from this research might also be applicable to other traditionally male-dominated industries.

Our study is not without shortcomings. Due to data limitations, we focused on support received from relatives and friends as an indicator of social support. Although we controlled for supportiveness of supervisors and co-workers for family life, it was not related to engineers' positive spillover. However, we are aware that there are various kinds of social support. For instance, for people in local community, neighbors or parents of children's school peers could be an important source of social support. It is possible that different kinds of social support affect men and women. Future research needs to consider the impact of diverse contexts of social

support on work-family positive spillover.

Notwithstanding these shortcomings, it is important that we found that Japanese engineers' experiences in in family life and work positively interact each other. We believe further investigation is needed to explore the work-family interface for women and men in engineering.

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